APPENDIX A
ASSESSMENT METHODOLOGY GUIDELINES FOR EVALUATING DESIGNATED USE STATUS OF MASSACHUSETTS SURFACE WATERS - 2007

WATER QUALITY CLASSIFICATION

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria required to sustain the designated uses; and include provisions for the prohibition of discharges (MassDEP 2006). These regulations should undergo public review every three years. The surface waters are segmented and each segment is assigned to one of the six classes described below. Each class is identified by the most sensitive and, therefore, governing water uses to be achieved and protected. Surface waters may be suitable for other beneficial uses, but shall be regulated by the Department of Environmental Protection to protect and enhance the designated uses.

Inland Water Classes

- *CLASS A* - These waters include waters designated as a source of public water supply and their tributaries. They are designated as excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation, even if not allowed. These waters shall have excellent aesthetic value. These waters are protected as Outstanding Resource Waters.
- *CLASS B* - These waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.
- *CLASS C* - These waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value.

Coastal And Marine Classes

- *CLASS SA* - These waters are designated as an excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, excellent habitat for fish, other aquatic life and wildlife may include, but is not limited to, sea grass. Where designated in the tables to 314 CMR 4.00 for shellfishing, these waters shall be suitable for shellfish harvesting without depuration (Approved and Conditionally Approved Shellfish Areas). These waters shall have excellent aesthetic value.
- *CLASS SB* - These waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass. Where designated in the tables to 314 CMR 4.00 for shellfishing, these waters shall be suitable for shellfish harvesting with depuration (Restricted and Conditionally Restricted Shellfish Areas). These waters shall have consistently good aesthetic value.
- *CLASS SC* - These waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for secondary contact recreation. They shall also be suitable for certain industrial cooling and process uses. These waters shall have good aesthetic value.

The Clean Water Act (CWA), Section 305(b), water quality reporting process is an essential aspect of the Nation's water pollution control effort. It is the principal means by which EPA, Congress, and the public evaluate existing water quality, assess progress made in maintaining and restoring water quality, and determine the extent of remaining problems. By this process, states report on waterbodies within the context of meeting their designated uses. These uses include: *Aquatic Life, Fish Consumption, Drinking Water, Primary Contact Recreation, Secondary Contact Recreation, Shellfish Harvesting* and *Aesthetics*. Two subclasses of Aquatic Life are also designated in the Massachusetts Surface Water Quality Standards (SWQS): Cold Water Fishery – waters capable of sustaining a year-round population of cold water aquatic life, such as trout – and Warm Water Fishery – waters that are not capable of sustaining a year-round population of cold water aquatic life (MassDEP 2006).

The SWQS, summarized in Table A1, prescribe minimum water quality criteria to sustain the designated uses. Furthermore, these standards describe the hydrological conditions at which water quality criteria must be applied (MassDEP 2006). In rivers the lowest flow conditions at and above which aquatic life criteria must be applied are the lowest mean flow for seven consecutive days to be expected once in ten years (7Q10). In waters where flows are regulated by dams or similar structures the lowest flow conditions at which aquatic life criteria must be applied are the flows equal to or exceeded 99% of the time on a yearly basis or another equivalent flow that has been agreed upon (see Mass DEP 2006 for more detail). In coastal and marine waters and for lakes the Massachusetts Department of Environmental Protection (MassDEP) will determine on a case-by-case basis the most severe hydrological condition for which the aquatic life criteria must be applied.

The availability of appropriate and reliable scientific data and technical information is fundamental to the 305(b) reporting process. It is EPA policy (EPA Order 5360.1 CHG 1) that any individual or group performing work for or on behalf of EPA establish a quality system to support the development, review, approval, implementation, and assessment of data collection operations. To this end MassDEP describes its Quality System in an EPA-approved Quality Management Plan to ensure that environmental data collected or compiled by the MassDEP are of known and documented quality and are suitable for their intended use. For external sources of information, MassDEP requires the following: 1) an appropriate Quality Assurance Project Plan (QAPP) including a laboratory Quality Assurance /Quality Control (QA/QC) plan; 2) use of a state certified lab (or as otherwise approved by DEP for a particular analysis); and 3) sample data, QA/QC and other pertinent sample handling information documented in a citable report. This information will be reviewed by MassDEP to determine its validity and usability to assess water use support. Data use could be modified or rejected due to poor or undocumented QAPP implementation, lack of project documentation, incomplete reporting of data or information, and/or project monitoring objectives unsuitable for MassDEP assessment purposes.

EPA provides guidelines to states for making their use support determinations (EPA 1997 and 2002, Grubbs and Wayland III 2000 and Wayland III 2001). The determination of whether or not a waterbody supports each of its designated uses is a function of the type(s), quality and quantity of available current information. Although data/information older than five years are usually considered "historical" and used for descriptive purposes they can be utilized in the use support determination provided they are known to reflect the current conditions. While the water quality standards (Table A1) prescribe minimum water quality criteria to sustain the designated uses, numerical criteria are not available for every indicator of pollution. Best available guidance from available literature may be applied in lieu of actual numerical criteria (e.g., freshwater sediment data may be compared to *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* 1993 by D. Persaud, R. Jaagumagi and A. Hayton). Excursions from criteria due solely to "naturally occurring" conditions (e.g., low pH in some areas) do not constitute violations of the SWQS.

Each designated use within a given segment is individually assessed as ***support*** or ***impaired***. When too little current data/information exist or no reliable data are available, the use is ***not assessed***. In this report, however, if there is some indication that water quality impairment may exist, and it is not "naturally occurring", the use is identified with an "Alert Status". It is important to note that not all waters are assessed. Many small and/or unnamed ponds, rivers, and estuaries have never been assessed; the status of their designated uses has never been reported to EPA in the Commonwealth's 305(b) Report or the Integrated List of Waters nor is information on these waters maintained in the waterbody system database (WBS) or the new assessment database (ADB). These waterbodies are considered ***not assessed other waters.***

Table A1. Summary of Massachusetts Surface Water Quality Standards (MassDEP 2006, MA DPH 2002, FDA 2003).

Dissolved Oxygen	Class A and Class B Cold Water Fishery (BCWF) and Class SA: ≥6.0 mg/L Class A and Class B Warm Water Fishery (BWWF) and Class SB: ≥5.0 mg/L Class C: Not <5.0 mg/L at least 16 hours of any 24-hour period and not <3.0 mg/L at any time. Class SC: Not <5.0 mg/L at least 16 hours of any 24-hour period and not <4.0 mg/L anytime. For all classes, where natural background conditions are lower than the criteria stated for each class, DO shall not be less than natural background conditions. Natural seasonal and daily variations that are necessary to protect existing and designated uses shall also be maintained.
Temperature	Class A CWF: ≤68°F (20°C) based on the mean of the daily maximum temperature over a seven day period in cold water fisheries, unless naturally occurring and ΔT due to a discharge ≤1.5°F (0.8°C). Class A WWF: ≤83°F (28.3°C) and ΔT due to a discharge ≤1.5°F (0.8°C). Class BCWF: ≤68°F (20°C) based on the mean of the daily maximum temperature over a seven day period in all cold water fisheries, unless naturally occurring, and ΔT due to a discharge ≤Δ3°F (1.7°C)

Table A1. Summary of Massachusetts Surface Water Quality Standards (MassDEP 2006, MA DPH 2002, FDA 2003).

	Class BWWF: ≤83°F (28.3°C) and ΔT due to a discharge ≤5°F (2.8°C) in rivers (based on the minimum expected flow for the month) and ΔT due to a discharge ≤3°F (1.7°C) in the epilimnion (based on the monthly average of maximum daily temperatures) in lakes, Class C and Class SC: ≤85°F (29.4°C) and ΔT due to a discharge ≤5°F (2.8°C) Class SA: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and ΔT due to a discharge ≤1.5°F (0.8°C) Class SB: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ T due to a discharge ≤1.5°F (0.8°C) between July and September and ≤4.0°F (2.2°C) between October and June. *For all classes, natural seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained. There shall be no changes from natural background conditions that would impair any uses assigned to each class, including those conditions necessary to protect normal species diversity, successful migration, reproductive functions or growth of aquatic organisms.* *For CWF waters, where a reproducing cold water aquatic community exists at a naturally higher temperature, the temperature necessary to protect the community shall not be exceeded and natural daily and seasonal temperature fluctuations necessary to protect the community shall be maintained.* Class B, C, SA, SB, and SC: See MassDEP 2006 for language specific to alternative effluent limitations relating to thermal discharges and cooling water intake structures.
pH	Class A, Class BCWF and Class BWWF: 6.5 - 8.3 SU and Δ0.5 outside the natural background range. Class C: 6.5 - 9.0 SU and Δ1.0 outside the natural background range. Class SA and Class SB: 6.5 - 8.5 SU and Δ0.2 SU outside the natural background range. Class SC: 6.5 - 9.0 SU and Δ0.5 SU outside the natural background range. There shall be no change from natural background conditions that would impair any use assigned to each class.
Solids	All Classes: *These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to each class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.*
Color and Turbidity	All Classes: *These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.*
Oil and Grease	Class A and Class SA: *Waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants.* Class SA: *Waters shall be free from oil and grease and petrochemicals.* Class B, Class C, Class SB and Class SC: *Waters shall be free from oil, grease, and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life.*
Taste and Odor	Class A and Class SA: *None other than of natural origin.* Class B, Class C, Class SB and Class SC: *None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to each class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.*
Aesthetics	All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.*
Toxic Pollutants	All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife. For pollutants not otherwise listed in 314 CMR 4.00, the National Recommended Water Quality Criteria: 2002, EPA 822-R-02-047, November 2002 published by EPA pursuant to Section 304(a) of the Federal Water Pollution Control Act, are the allowable receiving water concentrations for the affected waters, unless the Department either establishes a site specific criterion or determines that naturally occurring background concentrations are higher. The Department shall use the water quality criteria for the protection of aquatic life expressed in terms of the dissolved fraction of metals when EPA's 304(a) recommended criteria provide for use of the dissolved fraction* (see Mass DEP 2006 for more detail regarding permit limits, conversion factors, site specific criteria).
Nutrients	*Unless naturally occurring, all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses and shall not exceed the site specific criteria developed in a TMDL or as otherwise established by the Department pursuant to these Standards.*
Bacteria (MassDEP 2006 and MA DPH 2002)	Class A: *At water supply intakes in unfiltered public water supplies:* either fecal coliform shall not exceed 20 organisms/100 ml in all samples taken in any six month period, or total coliform shall not exceed 100

Table A1. Summary of Massachusetts Surface Water Quality Standards (MassDEP 2006, MA DPH 2002, FDA 2003).

Class A criteria apply to the *Drinking Water Use*. Class B and SB criteria apply to *Primary Contact Recreation Use* while Class C and SC criteria apply to *Secondary Contact Recreation Use*.	organisms/ 100 ml in 90% of the samples taken in any six month period. If both total and fecal coliform are measured, then only the fecal coliform criterion must be met. Class A other waters, Class B: Where *E.* coli is the chosen indicator at public bathing beaches as defined by MA DPH: The geometric mean of the five most recent *E. coli* samples taken within during the same bathing season shall not exceed 126 colonies/ 100 ml and no single sample taken during the bathing season shall exceed 235 colonies/ 100 ml (these criteria may be applied on a seasonal basis at the Department's discretion). Where Enterococci are the chosen indicators at public bathing beaches*:* The geometric mean of the five most recent samples taken during the same bathing season shall not exceed 33 colonies /100 ml and no single *Enterococci* sample taken during the bathing season shall exceed 61 colonies /100 ml. For other waters and, during the non bathing season, for waters at public bathing beaches: The geometric mean of all *E. coli* samples taken within the most recent six months shall not exceed 126 colonies/ 100 ml typically based on a minimum of five samples and no single sample shall exceed 235 colonies/ 100 ml. These criteria may be applied on a seasonal basis at the Department's discretion. The geometric mean of all *Enterococci* samples taken within the most recent six months shall not exceed 33 colonies/ 100 ml typically based on a minimum of five samples and no single sample shall exceed 61 colonies/ 100 ml. These criteria may be applied on a seasonal basis at the Department's discretion. Class C: *The geometric mean of all E. coli samples taken within the most recent six months shall not exceed 630 E. coli/ 100 ml, typically based on a minimum of five samples and 10% of such samples shall not exceed 1260 E. coli/ 100 ml.* This criterion may be applied on a seasonal basis at the discretion of the Department. Class SA: Waters designated for shellfishing: *Fecal coliform bacteria shall not exceed a geometric mean (Most Probable Number (MPN) method) of 14 organisms/100 ml, nor shall more than 10% of the samples exceed an MPN of 28 organisms/100 ml, or other values of equivalent protection based on sampling and analytical methods used by the Massachusetts Division of Marine Fisheries and approved by the National Shellfish Sanitation Program in the latest revision of the Guide for the Control of Molluscan Shellfish Areas (more stringent regulations may apply, see 314 CMR 4.06(1)(d)(5)).* Class SB: Waters designated for shellfishing: *Fecal coliform median or geometric mean MPN shall not exceed 88 organisms/100 ml, nor shall more than 10% of the samples exceed an MPN of 260 organisms/100 ml or other values of equivalent protection based on sampling and analytical methods used by the Massachusetts Division of Marine Fisheries and approved by the National Shellfish Sanitation Program in the latest revision of the Guide for the Control of Molluscan Shellfish Areas (more stringent regulations may apply, see 314 CMR 4.06(1)(d)(5)).* Class SA and Class SB: At public bathing beaches, as defined by MA DPH: No single *Enterococci* sample taken during the bathing season shall exceed 104 colonies /100 ml and the geometric mean of the five most recent *Enterococci* samples taken within the same bathing season shall not exceed 35 colonies /100 ml. At public bathing beaches during the non-bathing season and in non bathing beach waters: No single *Enterococci* sample shall exceed 104 colonies/ 100 ml and the geometric mean of all samples taken within the most recent six months, typically a minimum of five samples, shall not exceed 35 colonies/ 100 ml. These criteria may be applied on a seasonal basis at the discretion of the Department). Class SC: *The geometric mean of all Enterococci samples taken within the most recent six months shall not exceed 175 colonies/ 100 ml, typically based on the five most recent samples, and 10% of such samples shall not exceed 350 colonies/ 100 ml. This criterion may be applied on a seasonal basis at the discretion of the Department.*

Note: *Italics are direct quotations.* Δ criterion (referring to a change from natural background conditions) is applied to the effects of a permitted discharge.

DESIGNATED USES

The Massachusetts Surface Water Quality Standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected. Each of these uses is briefly described below (MassDEP 2006):

- *AQUATIC LIFE* - suitable habitat for sustaining a native, naturally diverse, community of aquatic flora and fauna, including, but not limited to, wildlife and threatened and endangered species and for their reproduction, migration, growth and other critical functions. Two subclasses of aquatic life are also designated in the standards for freshwater bodies: *Cold Water Fishery* - capable of sustaining a year-round population of cold water aquatic life, such as trout; *Warm Water Fishery* - waters that are not capable of sustaining a year-round population of cold water aquatic life. In certain waters, excellent habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass.
- *FISH CONSUMPTION* - pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, other aquatic life or wildlife for human consumption.
- *DRINKING WATER* - used to denote those waters used as a source of public drinking water. They may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). These waters are designated for protection as Outstanding Resource Waters under 314 CMR 4.04(3).
- *SHELLFISH HARVESTING* (in SA and SB segments) – Class SA waters where designated shall be suitable for shellfish harvesting without depuration (Approved and Conditionally Approved Shellfish Areas); Class SB waters where designated shall be suitable for shellfish harvesting with depuration (Restricted and Conditionally Restricted Shellfish Areas).
- *PRIMARY CONTACT RECREATION* - suitable for any recreation or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water. These include, but are not limited to, wading, swimming, diving, surfing and water skiing.
- *SECONDARY CONTACT RECREATION* - suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, including human consumption of fish, boating and limited contact incident to shoreline activities. Where designated, secondary contact recreation also includes shellfishing, including human consumption of shellfish. Human consumption of fish and shellfish are assessed as the *Fish Consumption* and *Shellfish Harvesting* uses, respectively.
- *AESTHETICS* - all surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.
- *AGRICULTURAL AND INDUSTRIAL* - suitable for irrigation or other agricultural process water and for compatible industrial cooling and process water.

The guidance used to assess the *Aquatic Life, Fish Consumption, Drinking Water, Shellfish Harvesting, Primary* and *Secondary Contact Recreation* and *Aesthetics* uses follows.

Note: Waterbodies affected by Combined Sewer Overflow (CSO) discharges are qualified in the standards, however, unless a variance has been granted and states otherwise, excursions from criteria are not allowed during storm events (designated uses are still applicable).

AQUATIC LIFE USE

This use is suitable for sustaining a native, naturally diverse, community of aquatic flora and fauna, including, but not limited to, wildlife and threatened and endangered species and for their reproduction, migration, growth and other critical functions. The results of biological (and habitat), toxicological, and chemical data are integrated to assess this use. The nature, frequency, and precision of the MassDEP's data collection techniques dictate that a weight of evidence be used to make the assessment, with biosurvey results used as the final arbiter of borderline cases. The following chart provides an overview of the guidance used to assess the status (support or impaired) of the *Aquatic Life Use*.

Variable	***Support*** Data available clearly indicates support or minor modification of the biological community. Excursions from chemical criteria (Table A1) not frequent or prolonged and may be tolerated if the biosurvey results demonstrate support.	***Impaired*** There are frequent or severe violations of chemical criteria, presence of acute toxicity, or a moderate or severe modification of the biological community.
BIOLOGY		
Rapid Bioassessment Protocol (RBP) III*	Non/Slightly impacted	Moderately or Severely Impacted
Fish Community	Best Professional Judgment (BPJ)	BPJ
Habitat and Flow	BPJ	Dewatered streambed due to artificial regulation or channel alteration, BPJ
Eelgrass Bed Habitat (Howes *et al.* 2003, Costello 2003)	Stable (No/minimal loss), BPJ	Loss/decline, BPJ
Non-native species	BPJ	Non-native species present, BPJ
Plankton/Periphyton	No/infrequent algal blooms	Frequent and/or prolonged algal blooms
TOXICITY TESTS**		
Water Column/Ambient	≥75% survival either 48 hr or 7-day exposure	<75% survival either 48 hr or 7-day exposure
Sediment	≥75% survival	<75% survival
CHEMISTRY-WATER**		
Dissolved oxygen (DO) (MassDEP 2006, EPA 1997)	Infrequent excursion from criteria (Table A1), BPJ (minimum of three samples representing critical period)	Frequent and/or prolonged or severe excursion from criteria [river and shallow lakes - exceedances >10% of representative measurements; deep lakes (with hypolimnion) - exceedances in the hypolimnetic area >10% of the surface area during maximum oxygen depletion].
pH (MassDEP 2006, EPA 1999a)	Infrequent excursion from criteria (Table A1)	Criteria exceeded >10% of measurements.
Temperature **(**MassDEP 2006,EPA 1997) [Note: typically the analysis of this variable is applicable to a summer index period ranging anywhere from mid-June through early September.]	Infrequent excursion from criteria (Table A1)	Small datasets: Criteria exceeded >10% of measurements. Deployed probe (long term) datasets: CWF: excursion based on mean of the daily maximum temperatures over a 7-day period. WWF: BPJ (e.g., >10% days in a 30 day period or three consecutive days in a 30 day period exceed 28.3°C, or 7-day average of daily maximum temperatures exceeds 28.3°C)
Toxic Pollutants (MassDEP 2006, EPA 1999a) Ammonia-N (MassDEP 2006, EPA 1999b) Chlorine (MassDEP 2006, EPA 1999a)	Infrequent excursion from criteria (Table A1) Ammonia is pH and temperature dependent[1] 0.011 mg/L (freshwater) or 0.0075 mg/L (saltwater) total residual chlorine (TRC)[2]	Frequent and/or prolonged excursion from criteria (exceeded >10% of measurements).

AQUATIC LIFE USE (CONTINUED)

CHEMISTRY-SEDIMENT**		
Toxic Pollutants (Persaud *et al.* 1993)	Concentrations ≤ Low Effect Level (L-EL), BPJ	Concentrations ≥ Severe Effect Level (S-EL)[3], BPJ
CHEMISTRY-TISSUE		
PCB – whole fish (Coles 1998)	≤500 μg/kg wet weight	BPJ
DDT (Environment Canada 1999)	≤14.0 μg/kg wet weight	BPJ
PCB in aquatic tissue (Environment Canada 1999)	≤0.79 ng TEQ/kg wet weight	BPJ

*RBP II analysis may be considered for assessment decision on a case-by-case basis, **For identification of impairment, one or more of the following variables may be used to identify possible causes/sources of impairment: NPDES facility compliance with whole effluent toxicity test and other limits, turbidity and suspended solids data, nutrient (nitrogen and phosphorus) data for water column/sediments. [1] Saltwater is temperature dependent only. [2] The minimum quantification level for TRC is 0.05 mg/L. [3]For the purpose of this report, the S-EL for total polychlorinated biphenyl compounds (PCB) in sediment (which varies with total organic carbon (TOC) content) with 1% TOC is 5.3 ppm while a sediment sample with 10% TOC is 53 ppm.

Note: National Academy of Sciences/National Academy of Engineering (NAS/NAE) guideline for maximum organochlorine concentrations (i.e., total PCB) in fish tissue for the protection of fish-eating wildlife is 500μg/kg wet weight (ppb, not lipid-normalized). PCB data (tissue) in this report are presented in μg/kg wet weight (ppb) and are not lipid-normalized to allow for direct comparison to the NAS/NAE guideline.

FISH CONSUMPTION USE

Pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or for the recreational use of fish, other aquatic life or wildlife for human consumption. The assessment of this use is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MA DPH), Bureau of Environmental Health Assessment (MA DPH 2008). The MA DPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species pose a health risk for human consumption. Hence, the *Fish Consumption Use* is assessed as impaired in these waters.

In July 2001 MA DPH issued new consumer advisories on fish consumption and mercury contamination (MA DPH 2001).

1. The MA DPH "…is advising pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age to refrain from eating the following marine fish; shark, swordfish, king mackerel, tuna steak and tilefish. In addition, MA DPH is expanding its previously issued statewide fish consumption advisory which cautioned pregnant women to avoid eating fish from all freshwater bodies due to concerns about mercury contamination, to now include women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age (MA DPH 2001)."
2. Additionally, MA DPH "…is recommending that pregnant women, women of childbearing age who may become pregnant, nursing mothers and children under 12 years of age limit their consumption of fish not covered by existing advisories to no more than 12 ounces (or about 2 meals) of cooked or uncooked fish per week. This recommendation includes canned tuna, the consumption of which should be limited to 2 cans per week. Very small children, including toddlers, should eat less. Consumers may wish to choose to eat light tuna rather than white or chunk white tuna, the latter of which may have higher levels of mercury (MA DPH 2001)."

Other statewide advisories that MA DPH has previously issued and are still in effect are as follows (MA DPH 2001):

1. Due to concerns about chemical contamination, primarily from polychlorinated biphenyl compounds (PCB) and other contaminants, no individual should consume lobster tomalley from any source. Lobster tomalley is the soft green substance found in the tail and body section of the lobster.
2. Pregnant and breastfeeding women and those who are considering becoming pregnant should not eat bluefish due to concerns about PCB contamination in this species.

The following is an overview of EPA's guidance used to assess the status (support or impaired) of the *Fish Consumption Use*. Because of the statewide advisory no waters can be assessed as support for the *Fish Consumption Use*. Therefore, if no site-specific advisory is in place, the *Fish Consumption Use* is not assessed.

Variable	***Support*** No restrictions or bans in effect	***Impaired*** There is a "no consumption" advisory or ban in effect for the general population or a sub-population for one or more fish species or there is a commercial fishing ban in effect.
MA DPH Fish Consumption Advisory List	Not applicable, precluded by statewide advisory (Hg)	Waterbody on MA DPH Fish Consumption Advisory List

Note: MA DPH's statewide advisory does not include fish stocked by the state Division of Fisheries and Wildlife or farm-raised fish sold commercially.

Northeast Regional Mercury TMDL: On 20 December 2007 the U.S. EPA approved the Northeast Regional Mercury Total Maximum Daily Load (TMDL). This TMDL is a Federal Clean Water Act mandated document that identifies pollutant load reductions necessary for regional waterbodies to meet and maintain compliance with state and federal water quality standards. It was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers inland waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

DRINKING WATER USE

The term *Drinking Water Use* denotes those waters used as a source of public drinking water. These waters may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). They are designated for protection as Outstanding Resource Waters in 314 CMR 4.04(3). MassDEP's Drinking Water Program (DWP) has primacy for implementing the provisions of the federal Safe Drinking Water Act (SDWA). Except for suppliers with surface water sources for which a waiver from filtration has been granted (these systems also monitor surface water quality) all public drinking water supplies are monitored as finished water (tap water). Monitoring includes the major categories of contaminants established in the SDWA: bacteria, volatile and synthetic organic compounds, inorganic compounds and radionuclides. The DWP maintains current drinking supply monitoring data. The suppliers currently report to MassDEP and EPA the status of the supplies on an annual basis in the form of a consumer confidence report (http://yosemite.epa.gov/ogwdw/ccr.nsf/Massachusetts). Below is EPA's guidance to assess the status (support or impaired) of the drinking water use.

Variable	***Support*** No closures or advisories (no contaminants with confirmed exceedances of maximum contaminant levels, conventional treatment is adequate to maintain the supply).	***Impaired*** Has one or more advisories or more than conventional treatment is required or has a contamination-based closure of the water supply.
Drinking Water Program (DWP) Evaluation	See note below	See note below

Note: While this use is not assessed in this report, information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/water/drinking.htm and from local public water suppliers.

SHELLFISHING USE

This use is assessed using information from the Department of Fish and Game's Division of Marine Fisheries (DMF). A designated shellfish growing area is an area of potential shellfish habitat. Growing areas are managed with respect to shellfish harvest for direct human consumption, and comprise at least one or more classification areas. The classification areas are the management units, and range from being approved to prohibited (described below) with respect to shellfish harvest. Shellfish areas under management closures are *not assessed.* Not enough testing has been done in these areas to determine whether or not they are fit for shellfish harvest, therefore, they are closed for the harvest of shellfish.

Variable	***Support*** SA Waters: Approved[1] SB Waters: Approved[1], Conditionally Approved[2], or Restricted[3]	***Impaired*** SA Waters: Conditionally Approved[2], Restricted[3], Conditionally Restricted[4], or Prohibited[5] SB Waters: Conditionally Restricted[4] or Prohibited[5]
DMF Shellfish Project Classification Area Information (MA DFG 2000)	Reported by DMF	Reported by DMF

NOTE: Designated shellfish growing areas may be viewed using the MassGIS datalayer available from MassGIS at http://www.mass.gov/mgis/dsga.htm. This coverage currently reflects classification areas as of July 1, 2000.

[1] **Approved** - "...open for harvest of shellfish for direct human consumption subject to local rules and regulations..." An approved area is open all the time and closes only due to hurricanes or other major coastwide events.

[2] **Conditionally Approved** - "...subject to intermittent microbiological pollution..." During the time the area is open, it is "...for harvest of shellfish for direct human consumption subject to local rules and regulations…" A conditionally approved area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, shellfish harvested are treated as from an approved area.

[3] **Restricted** - area contains a "limited degree of pollution." It is open for "harvest of shellfish with depuration subject to local rules and state regulations" or for the relay of shellfish. A restricted area is used by DMF for the relay of shellfish to a less contaminated area.

[4] **Conditionally Restricted** - "...subject to intermittent microbiological pollution..." During the time area is restricted, it is only open for "the harvest of shellfish with depuration subject to local rules and state regulations." A conditionally restricted area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, only soft-shell clams may be harvested by specially licensed diggers (Master/Subordinate Diggers) and transported to the DMF Shellfish Purification Plant for depuration (purification).

[5] **Prohibited -** Closed for harvest of shellfish.

PRIMARY CONTACT RECREATION USE

This use is suitable for any recreational or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water during the primary contact recreation season (1 April to 15 October). These include, but are not limited to, wading, swimming, diving, surfing and water skiing. The chart below provides an overview of the guidance used to assess the status (support or impaired) of the *Primary Contact Recreation Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

Variable	***Support*** Criteria are met, no aesthetic conditions that preclude the use	***Impaired*** Frequent or prolonged violations of criteria and/or formal bathing area closures, or severe aesthetic conditions that preclude the use
Bacteria (105 CMR 445.000) Minimum Standards for Bathing Beaches State Sanitary Code) (MassDEP 2006)	At "public bathing beach" areas: Formal beach postings/advisories neither frequent nor prolonged during the swimming season (the number of days posted or closed cannot exceed 10% during the locally operated swimming season). Collected samples* meet the geometric mean criteria (Table A1). Shellfish Growing Area classified as "Approved by DMF.	At "public bathing beach" areas: Formal beach closures/postings >10% of time during swimming season (the number of days posted or closed exceeds 10% during the locally operated swimming season). Collected samples* do not meet the geometric mean criteria (Table A1).
Aesthetics (MassDEP 1996) - *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance* [growth or amount] *species of aquatic life*		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

* Data sets to be evaluated for assessment purposes must be representative of a sampling location (at least five samples per station recommended) and the season being analyzed, as described in the SWQS (see Table 1). Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use. Because of low sample frequency (i.e., less than ten samples per station) an impairment decision will not be based on a single sample exceedance (i.e., the geometric mean of five samples is < 126 *E. coli* colonies/100 ml but one of the five sample exceeds 235 *E. coli* colonies/100 ml). The method detection limit (MDL) will be used in the calculation of the geometric mean when data are reported as less than the MDL (e.g., use 20 cfu/100 ml if the result is reported as <20 cfu/100 ml). Those data reported as too numerous to count (TNTC) will not be used in the geometric mean calculation; however frequency of TNTC sample results should be presented.

SECONDARY CONTACT RECREATION USE

This use is suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities. Following is an overview of the guidance used to assess the status (support or impaired) of the *Secondary Contact Use*. Excursions from criteria due to natural conditions are not considered impairment of use.

Variable	***Support*** Criteria are met, no aesthetic conditions that preclude the use	***Impaired*** Frequent or prolonged violations of criteria, or severe aesthetic conditions that preclude the use
Bacteria (MassDEP 2006)	Collected samples* meet the Class C or SC geometric mean criteria (see Table A1). Shellfish Growing Area classified as "Approved" by DMF.	Collected samples* do not meet the Class C or SC geometric mean criteria (see Table A1).
Aesthetics (MassDEP 2006) - *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance* [growth or amount] *species of aquatic life*		
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

*Data sets to be evaluated for assessment purposes must be representative of a sampling location (at least five samples per station recommended) over time. Because of low sample frequency (i.e., less than ten samples per station) an impairment decision will not be based on a single sample exceedance. Samples collected on one date from multiple stations on a river are not considered adequate to assess this designated use.

AESTHETICS USE

All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. The aesthetic use is closely tied to the public health aspects of the recreational uses (swimming and boating). Below is an overview of the guidance used to assess the status (support or impaired) of the *Aesthetics Use*.

Variable	***Support*** Narrative "free from" criteria met	***Impaired*** Objectionable conditions frequent and/or prolonged
Odor, oil and grease, color and turbidity, floating matter	Narrative "free from" criteria met or excursions neither frequent nor prolonged, BPJ.	Narrative "free from" criteria not met - objectionable conditions either frequent and/or prolonged, BPJ.
Transparency (MA DPH 1969)	Public bathing beach and lakes – Secchi disk depth ≥1.2 meters (≥ 4') (minimum of three samples representing critical period).	Public bathing beach and lakes - Secchi disk depth <1.2 meters (< 4') (minimum of three samples representing critical period).
Nuisance organisms	No overabundant growths (i.e., blooms) that render the water aesthetically objectionable or unusable, BPJ.	Overabundant growths (i.e., blooms and/or non-native macrophyte growth dominating the biovolume) rendering the water aesthetically objectionable and/or unusable, BPJ.

REFERENCES

Coles, J.F. 1998. *Organochlorine compounds in fish tissue for the Connecticut, Housatonic,* and *Thames River Basins study unit, 1992-94.* USGS Water-Resources Investigations Report 98-4075. U.S. Geological Survey, National Water Quality Assessment Program, Water Resources Division, Marlborough, MA.

Costello, C. 2003. *Mapping Eelgrass in Massachusetts, 1993-2003.* Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Boston, MA.

Environment Canada. 1999. *Canadian Environmental Quality Guidelines* [Online]. Environment Canada. Retrieved 04 November 1999 from http://www.ec.gc.ca/CEQG-RCQE/English/default.cfm updated 28 September 1998.

EPA. 1997. *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates Report Contents.* U.S. Environmental Protection Agency, Assessment and Watershed Protection Division (4503F); Office of Wetlands, Oceans, and Watersheds; Office of Water, Washington D.C.

EPA. 1999a. *Federal Register Document* [Online]. U.S. Environmental Protection Agency, Washington, D.C. Retrieved 19 November 1999 from http://www.epa.gov/fedrgstr/EPA-WATER/1998/December/Day-10/w30272.htm.

EPA. 1999b. *1999 Update of Ambient Water Quality Criteria for Ammonia*. U.S. Environmental Protection Agency, Office of Water and Office of Science and Technology, Washington, D.C. and Office of Research and Development, Duluth, MN.

EPA. 2002. *Consolidated Assessment and Listing Methodology – toward a compendium of best practices*. U.S. Environmental Protection Agency; Office of Wetlands, Oceans and Watersheds; Washington, D.C.

FDA. 2003. G*uide for the Control of Molluscan Shellfish 2003 Revision.* [Online]. Updated 12 November 2004. United States Food and Drug Administration, Department of Health and Human Services, National Shellfish Sanitation Program. http://www.cfsan.fda.gov/~ear/nss2-toc.html. Accessed 2005 December 5.

Grubbs, G.H. and R.H. Wayland III. 2000. Letter to Colleague dated 24 October 2000. *EPA recommendations on the use of fish and shellfish consumption advisories and certain shellfish growing area classifications in determining attainment of water quality standards and listing impaired waterbodies under section 303(d) of the Clean Water Act*. United States Environmental Protection Agency; Office of Wetlands, Oceans and Watersheds; Washington, D.C.

Howes, B.L., R. Samimy, and B. Dudley. 2003. *Massachusetts Estuaries Project Site-Specific Nitrogen Thresholds for Southeastern Massachusetts Embayments: Critical Indicators Interim Report Revised December 22, 2003*. University of Massachusetts Dartmouth, School of Marine Science and Technology (SMAST), Coastal Systems Laboratory. New Bedford, MA and Massachusetts Department of Environmental Protection, Lakeville, MA.

MassDEP. 2006. *Massachusetts Surface Water Quality Standards (Revision of 314 CMR 4.00, effective December 29, 2006)*. Massachusetts Department of Environmental Protection, Boston, MA.

MA DFG. 2000. *Designated Shellfish Growing Areas Datalayer – July 2000.* Published by MassGIS in October 2000. Massachusetts Department of Fish and Game, Division of Marine Fisheries, Boston, MA.

MA DPH. 1969. *Article 7 Regulation 10.2B of the State Sanitary Code.* Massachusetts Department of Public Health. Boston, MA.

MA DPH. 2001. *MA DPH Issues New Consumer Advisories on Fish Consumption and Mercury Contamination.* Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Boston, MA.

MA DPH. 2002. *105 CMR 445.000: Minimum Standards For Bathing Beaches, State Sanitary Code, Chapter VII* [Online]. Massachusetts Department of Public Health, Division of Community Sanitation Regulations and Statutes, Boston, MA. Retrieved 19 September 2002 from http://www.state.ma.us/dph/dcs/csanregs.htm.

MA DPH. 2008. *Freshwater Fish Consumption Advisory List – July 2008.* Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Boston, MA.

NEIWPCC. 2007. *Northeast Regional Mercury TMDL Fact Sheet October 2007.* [Online]. New England Interstate Water Pollution Control Commission, Lowell, MA. Retrieved 23 January 2008 from http://www.neiwpcc.org/mercury/mercury-docs/FINAL%20Northeast%20Regional%20Mercury%20TMDL%20Fact%20Sheet.pdf.

Northeast States. 2007. *Northeast Regional Mercury Total Maximum Daily Load.* Connecticut Department of Environmental Protection, Maine Department of Environmental Protection, Massachusetts Department of Environmental Protection, New Hampshire Department of Environmental Services, New York State Department of Environmental Conservation, Rhode Island

Department of Environmental Management, Vermont Department of Environmental Conservation, New England Interstate Water Pollution Control Commission. October 24, 2007.

Persaud, D., R. Jaagumagi, and A. Hayton. 1993. *Guidelines for the protection* and *management of aquatic sediment quality in Ontario.* Water Resources Branch, Ontario Ministry of the Environment, Ontario, Canada.

Wayland III, R.H. 2001. Memorandum to EPA Regional Water Management Directors, EPA Regional Science and Technology Directors, and State, Territory and Authorized Tribe Water Quality Program Directors dated 19 November 2001. Re: *2002 Integrated Water Quality Monitoring and Assessment Report Guidance*. U.S. Environmental Protection Agency; Office of Wetlands, Oceans and Watersheds; Washington, D.